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Primarily Criteria for the Architectural Treatment of Archaeological Sites' Boundaries in Sensitive Landscapes

Case Study: Luxor's Western Bank

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Abstract:

Archaeological sites need to be enclosed for many reasons. Usually they are integral to their surrounding landscapes that are usually sensitive from ecological, visual, and/or cultural viewpoints. The architectural treatment of such enclosures or boundaries in such cases becomes a very delicate matter with conflicting aspects. Internationally, there are very positive cases based on strong guidelines. In Egypt, with archaeological sites needing protection without affecting their relation with their surrounding sensitive landscapes a manner is needed where boundaries are designed in ways that do not affect the site or the landscape or even their mutual relation. The case study of the Western bank of Luxor is presented as an offensive wall being built around the largest mortuary temple destroying the visual and cultural aspects of the place.

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Keywords: Archaeological sites; boundaries; sensetive sites; Luxor; Western Bank; Landscape ; Amenhotep III

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Introduction:

Many archaeological sites are located in landscapes with unique nature and history and sometimes socio-cultural values. In Many cases at least the ecological and scenic settings resemble a reminiscent background of what used to encompass them in the past, thus, forming not only a background, but usually an inseparable component of the monument itself and its premises or enclosure. The archaeological site's need for delineation and enclosure for many reason e.g. security, visiting arrangements, or property dictates the presence of a means for definition for the

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boundaries. Such boundaries resemble an interface between the monument and the surrounding landscape. In the more fortunate cases around the world, there are specific rules or at least guidelines to determine the type of action to be taken to do that through a well formalized written code or guidelines. Unfortunately, and despite its richness in archeological sites either in urban locations or in natural or manmade landscapes, and despite the presence of a law for antiquities, Egypt suffers the absence of any of such codes. Naturally, certain norms are present and indeed " The Antiquities'' protection law 117of 1983 and Amendment No. 3 0f 2010 " (The Official Gazette, 2010) provide some guidance, but they are usually on the general side defining frameworks not detailed applicable written rules. Either small or major decisions are decided by a supreme committee. Although this might seem a very transparent and just, but the applied practice shows very grave flaws that cannot be accepted to continue as will be demonstrated later concerning the case study and more.

A great deal of literature can be found on the guidelines for the treatment of archaeological site, many of which are directed to specific areas with local identity and history. England for example with its long heritage since early history has this heritage of all sort of sites and structures from primitive sites to palaces and castles distributed all over its rich green landscape with well formalized design guidelines for site design, treatment and management including visiting arrangements as those stated by the Heritage Branch of the Department of Planning in the State of Wales (2009). The United States with its ancient sites of early Americans and Indians scattered in its variable landscapes has strong well formalized guidelines too (South, 2002). This indicates and asserts the need to create general guidelines for Egypt's heritage and detailed local ones for every region with uniform ecological, cultural and visual aspects. Defiantly, some sites might need further tailored ones conforming to the general ones but treating certain individual characteristics of certain sites with unique condition or qualities.

As the paper's title suggests, addressing the subject of creating guidelines or at least addressing it through the design criteria that is dealt with through the boundaries of archaeological sites from an architectural viewpoint being a grey area concerning presenting solutions and materials with current technologies and concepts but can have a very negative or positive effect on the site and its landscape. It also discusses sensitive landscapes. Moreover, the local condition and practice needs to be approached. Finally, the study area should be examined.

Archaeological sites and historic places are fragile and non-renewable resources, they are unique and irreplaceable; destruction of a site is permanent and irreversible as stated in 'A guide to Best Practices for Archaeological tourism'. According to the Scottish Natural Heritage Council, they are constructed through time and they exist within a larger setting that includes both the environment and the local communities (Scottish Natural Heritage and Historic Scotland, 2004). (Colarfanceschi, 2010) asserts that archeological sites are considered sensitive landscapes, possessing specific natural and geographical conditions associated with certain cultural and historic traits that need to be conserved. Setting boundaries to these sites is sometimes difficult as they are integrated with adjacent landscape and sites (Mosler, 2005), but is a much needed process in light of the fact that these sites are vulnerable to exposure to elements, looting, irresponsible re-use and unrestricted tourism (Matero, 2008). The layout of the boundary should follow certain guidelines set by archeological site management plans concerning the addition or removal of items (Historic Scotland, 2010) , (Anschuetz; Wilshusen; and Scheick, 2001).), (Kalman, 2014) and (Steiner, 2000).

Egypt is among the countries where history is encountered in every step, archeological and historic sites are scattered all over the landscape (Abulnour, (2013). No part of Egypt is immune to the attacks on its heritage in the Eastern desert, along the Red Sea coast, in several oases and in Upper Egypt (Tully; Hanna, 2013). Although several international conferences and acts addressed this topic, as the Law of Protection of Antiquities, the International Codifying of Archaeological Site Conservation principles and procedures, Athens 1931, the UNESCO General Conference on International Principles Applicable to Archaeological Excavations, New Delhi 1956, the ICOMOS Venice Charter 1964, in Australia 1979, and finally ICOMOS, Larsen, Switzerland 1990, all present in The Getty Conservation Institute policy documents, proper site protection and delineation is still lacking in archaeological sites in Egypt, at least as far as the boundaries are concerned . A Study at (Yarmouk University, 2004) was conducted on similar sites in Abila, Jordan, and guidelines on boundary setting were drawn. Although there are good examples of treating the issue of boundaries but case study presented by the paper points out the foul and irrational practices carried out sometimes in and around archaeological sites in Egypt even on the richest area in Egypt and its integral landscape with very negative effects on both, calling for an immediate drawing and application of proper transparent site preservation regulations in Egypt through a written code and guidelines.

1. A Reviling story:

When worried Egyptians and interested international enthusiasts were surprised by the sudden attack on the serene vista and landscape of the Western bank by an offensive concrete structure around the Mortuary temple of Amenhotep III, a campaign was formed comprising local citizens, and all sorts of Egyptians from all over the country. Archaeologists, Architects, artists, writers, journalists, and media people and simple were among the most effective in this campaign. The author was one of the active members too. The structure consists of long concrete posts or columns tied by a concrete tie beam to host steel fencing vertical units (A.1. Fig. 1). The executed part is supposed to be a sample to be repeated. As the concrete works commenced that rupturing the scenery and disfiguring the temple view, the campaign was formed monitoring the work day by day and criticizing its effect on the visual and cultural environment. It was learnt that the expedition working in the field is building and financing the work approved and encouraged by the governor of Luxor and his staff in the eastern bank. The expedition proposed a complete design (A1. Fig.2) that included the erection of a complete surrounding wall and the re-erection of some of the walls using rammed earth techniques with a study of the visitors, movement including a massive wall on exit. The intensity and anger of protests lead to the lowering of the height of the columns and hence design in general during execution. It also resulted in using natural stones to cover the beam, but the steel caging structure remained as an offensive intrusion to the temple with its massive colossi and whole landscape and its values absent from the governorate officials, vision and neglected by the executers. The effect was doubled by the temple's location on the entrance of the Theban necropolis and archaeological sites forming the main component of any perspective for the area due to the enormous size of the temple and its long stretch parallel to the main road to the area (more than 1100 m) and stretching width (more than 600 m). As the campaign got more into things, shocking sorrowful news were leant. It is known that the huge nowadays area of the temple is only a small part of the largest mortuary temples in Egypt. Defined now by the main road to the south and the agricultural land to the north, it resembles only the main axis and structures of the original temple area. The Temple had a northern gate located nowadays outside the defined premises amidst agricultural land. It was guarded by two large colossi of the

Fig. 1. (a)

Fig. 1. (b)

Fig .1 (a) The Western bank of Luxor is an intense example of upper Egyptian landscape, being the necropolis of Ancient Egyptian Empire. Its topography and geological formation created a profound landscape and ecosystem that wraps the archaeological sites inseparably. While the tombs are located on the hilly sides and valleys, the mortuary temples are located on the edges between the agricultural flood plain and higher desert areas. Larger temples had to expand in the flood plain being subject to floods, settlement and maximized seismic shocks. (b) The Mortuary temple of Amenhotep III, the largest mortuary temple stretches into the green plain with its fields, natural vegetation and scattered vernacular housing. The dominant mountainous hilly mass is linked through the elements of the landscape having a unique balance between manmade geometric landscape and natural elements of the landscape and the ecosystem. Such cultural marks are part of the archaeology of the area and its past and present cultural and socioeconomic aspects that should be preserved and protected not only from robbery and land grabbing, but also from authoritarian human factors resulting in irreversible catastrophes. This calls for adopting governing transparent guidelines.



Fig. 2. (a) Fig. 2. (b) Fig. 2. (c)

Fig. 2 The completed design: The final product reveals the fallacy of transparency. A semi-transparent foreign structure implanted in a homogeneous landscape (a) supposedly transparent, the wall creates an ugly curtain of different nature foreign to both the landscape and monuments and disturbing it. The open and historic nature of the landscape is ruined by monotonous steel and concrete columns. (b) The In perspective the steel and concrete members are condensed forming a visually solid sheet. The use of heavy concrete columns is not at all justified. The effect is increased by the sheer length of the wall and its location on the mouth of the whole landscape and archaeological sites; thus, destroying the visual gradual change from green fields and flat sites to the rising hilly desert and mountain. The destruction is great and permanent calling for immediate correction to maintain the integrity and attractiveness of the site and landscape. (c) Shows how unneeded is the high structure. Under heavy criticism, the design was modified to host terraces making use of an internal retaining wall supporting the difference of level between site and road. This provides an acceptable solution if applied to the whole wall creating at least 2.00 m drop and would be aided by cameras and sensors.

king first discovered by Gerhard Haeny (Haeny 1981). (A.1. Fig. 3). Their broken buried masses were then re-discovered by the Egyptian expedition as stated by Hawass, and Wagdy, (Wuyts, 2011). They were supposed to be restored and reconstructed at their place. With claims of fear of water table effect on agricultural land, they were transported by the German expedition working at the main temple (and building the wall) - and with the approval of the Egyptian authorities - to a higher spot between the mortuary temples of queen Tawesret and King Merenepetah, Thus, changing and disfiguring permanently the structure of the temple and the visual aspects of the area and the three temples. The strong campaign that was naturally opposed by some authority figures was able to finally achieve some success when the expedition presented another sample wall that came homogeneous with the landscape and vista and allowed a complete open view to the temple and the whole area (Fig 3). The case is still open concerning the rest of the boundary especially that the concept presented by the Expedition presents a very negative effect on the scenic environment of the whole area , either the monotonous long wall or the intended great wall blocking the view and landscape and the graceful mountain on exit from the necropolis side .

This sad story even if it had any good intentions in it clarifies the disastrous conditions where the absence of solid written laws, rules or guidelines can lead to destructive results to the monuments, archeological sites and their direct and larger landscape laden with visual and cultural values relating it to its original surrounding. Leaving decisions of such importance and delicacy to the personal judgment of individual or even groups of officials and expeditions with no governing guidelines is a dangerous practice that has to stop immediately. Discussing the creation of such is the main aim goal of the paper.

Fig. 3

Fig 3 under pressure of the public campaign a simple solution was introduced using local material of mud bricks and allowing natural transparency preserving the spirit of the place.

2. Sensitive landscapes – Identification and design process :

The term sensitive landscape is frequently used to indicate ecological sensitivity; such sensitivity can however be coupled by or indicative to other types of sensitivities (Beer, 1990). Visual sensitivity is a major concern, so is cultural sensitivity which can be historic too. There can be many approaches to these issues, but the term (sensitive) may indicate the adoption of an ecological approach where the landscape is regarded as an ecosystem forming usually a part of a larger ecosystem and may be subdivided into smaller ecosystem units e.g. the ecosystem of the western bank includes several sub-ecosystems with edges or transitional ecosystems in between The desert and hills, the manmade human ecosystem of agricultural land and finally the river ecosystem with hinter areas or edges in between such as water front areas (originally seasonal sandbars and ponds) and desert edge near the green areas with their dry grasses and desert vegetation of Acacias, palm trees, Tamarix trees and so. They form a very characteristic and integral feature of the landscape. Many of the mortuary temples are located on the ecological edge of desert and flood plain (agricultural land) or near them. The temples of Ramesseum and Amenhotep III suffered their presence on such location causing their destruction. The understanding of the matrix or order of the ecosystem (landscape) with its three main concepts (Structure- Function – distribution or locational patter) is an essential issue on true and deep understanding of any site and its non-living (abiotic) and living (biotic) components with their interrelations and patterns of flow of water, energy and materials (Lyle, 1999). This ecological approach is not applied regularly on addressing archaeological and heritage studies, although it is important to understand the inner workings of a landscape to be able to sustain and maintain its vitality and character. The visual form and characteristics of a landscape and its pre-industrial human cultural products are a translation of the landscape's ecological order and qualities. The man made landscape of the western bank and the now-gone houses of Gourna are a translation of its ecological order and capacities. According to ecological site design basics, a preliminary point would be running an inventory of the site and analyzing it to understand its inner processes responsible for its form, health and regeneration (Lyle, 1999). Many archaeological sites are located within human ecosystems where man has replaced or altered the natural processes by new ones to achieve human functions and goals creating new systems or landscapes e.g. Egypt's agricultural lands that replaced the natural alluvial flood plains. In Upper Egypt it is common place to find villages with their vernacular mud brick buildings on the hilly sides of the flat green fields on the edge of desert. In areas where the valley is wide enough, villages are distributed in the green valley landscape on higher ground. The western bank was no exception as its hills hosted dwellers making use of the tombs' chambers, hence, the need to evacuate them arose. But this did not mean total removal as they formed part of the cultural landscape. Miraculously, very few buildings were saved in the nick of time at the southern end of Gourna at Gourna Moraee which is planned to be used as part of visiting locations. In older times with lower density and the absence of industrial age technologies, man lived in this environment harmoniously from ecological, cultural, social and visual viewpoints. In recent years with exploding population, limited land and lack of firm yet understanding management, things started to get out of hand especially after the January 2011 revolution. It should be mentioned that some very positive measures were taken such as the dewatering system in the area to lower the dangerous rising ground water level but a holistic wise management of the landscape and its major element of a very important part of its biotic components (the people) was missing. Humans are complicated specie in handling with their cultural and socio-economical needs and structures (Beer, 1990). This complexity adds to the sustainable ecological design process of sites and landscapes being developed since the late 60s (McHarg, 1969) till the present (DeKay, 2011) developed to address the design of sites in a sustainable manner. It is time to apply such design process to archaeological sites with archaeological and human factors (and needs) incorporated in the process. Beer (Beer, 1990) for instance, presents a simplified classic example of such a process and needed methodology in England presenting, analyzing and dismantling the matrixes in a site with multi functions and elements including archaeological remains with visual aspects included. The ecological design process is a flexible adaptable one that can be fitted to address situation with a variety of issues and maybe conflicting ones. An important role for such a process is to identify the hidden interrelation between the site's components and hidden processes either ecological or human as such relations and processes are responsible of shaping the site's identity, integrity and health. The idea is to find a manner with which all design issues, factors and elements shaping and composing the landscape and its

Fig. 4 (a)

Fig. 4 (b)

Fig .4 (a) A landscape laden with values needs sensitivity in dealing with it. The heritage landscape of the western bank in Luxor with its natural and made elements laden with cultural and historic values cannot be dealt with and ruined with imposed readymade industrial solutions. (b) The new forcibly imposed wall of the Temple of Amenhotep III during construction. A cancerous foreign body in a homogeneous landscape (Natural topography and vegetation, ancient sites and elements, vernacular architecture, the farm land and related population).

natural and human factors can be seen and addressed with their interactions and even hidden relations in a rational process. Through such a process, a beforehand assessment of any action taken in the landscape concerning its inhabitants or components can be anticipated to guide and judge decisions. This includes visual studies. The treatment of the visually destructive steel wall of Amenhotep III temple presented earlier reveals the absence of any such studies. The case is the same in Gourna. It is true that the situation needed some painful measures, but this needed parallel ones that would maintain cultural and socio-economic factors of the inhabitants. The one directional decision of evacuation with total removal of vernacular architecture lacked a holistic vision encompassing all aspects and deep thorough mitigation measures. The only vision prevailing was the debatable open museum vision lacking the all-encompassing view.

2.1. The Natural landscape and the cultural landscape of archaeological sites

In many cases archaeological sites are located in landscapes with unique nature or ones with well formalized special characteristics. Such nature, especially if it still keeps the ancient nature of the original landscape or carries the marks of cultural evolution or/and accumulation forms an integral part of the site. The surrounding culture of the local population and the physical and spiritual features of their culture are also an integral component of the landscape that should be maintained. This can be a culturally sensitive landscape. A controversial discussion is never closed, for instance when addressing the lost vernacular architecture of old Gourna built on the Theban Nobles' necropolis that was evacuated but its total removal still a matter of great debate, also the relocation of the inhabitants in modern homes lacking the social and cultural vividness and fabric of vernacular architecture complimenting the landscape. The interaction of the local community with visitors was an integral part of the experience that was lost forever. (Tully; Hanna, 2013).

In Egypt in particular, all the agricultural landscapes are manmade as Egyptian had controlled and reclaimed all the areas that was served by the Nile's yearly flooding. This created a checker like landscape with irregularities here and there on the outer fringes of fields and where the fields meet the desert. The erection of the high dam in Aswan has affected the landscape by preventing the flood that protected the agricultural lands through inhibiting building on them to avoid yearly flooding. The Egyptian landscape especially in Upper Egypt is one of contrast. This contrast was much greater before the High Dam. One can see a well-defined line between green agricultural land that received the flood and the higher yellow desert. This distinction does still exist, but in some areas and with modern irrigation techniques this is changing rapidly. It is important to preserve this relation in areas with archaeological sites as those landscapes resemble integral part of them. This is already applied in many areas of Egypt, by declaring large premises for areas with archaeological sites, but the loose grip of the state during and after the January 2011 revolution has caused great violations to such premises some containing many undiscovered tombs that were looted (Tully, and Hanna, 2013); (Parcak, 2015); (Marchant, 2011); (Hanna, 2013); (Ikram, and Hanna, 2013). Archaeological sites were attacked and seized by some locals either for robbery or for the property itself and its use as agricultural land or graveyards.

2.2. The Nature of the western bank Luxor vs. Luxor as an open museum

The Nature of the Western bank in Luxor is one with profound features either natural or manmade. Not only that it resembles the traditional landscape of Upper Egypt of the ancient agricultural valley defined by desert and hills reaching the height of a small mountain sometimes, but it is unique because of the relation between the desert mountain with its ancient sacred summit in ancient Egypt and the green valley. By studying the map, it can be clearly noticed that the mountainous structures approach the valley acutely rendering itself as the sacred necropolis of Thebes enveloping the scene. The landscape holds the large mortuary temples of the great kings of the empire mostly located on the hinter land between the desert and fields, sometimes stretching into the fields where they were more susceptible to the negative effects of time, flooding, land settlement and earthquakes e.g. the temples of Ramsium, and the mortuary temples of king Amenhotep III. The green valley with its trees and palm trees around fields and scattered peasant housing (now sprawling in a dangerous manner) is a very important component of the vista and surrounding landscapes. Scattered Acacia and palm trees being naturally occurring and distributed in the rather geometric grid of the manmade landscape of fields are strong features of an upper Egyptian landscape with the mountain and desert in the background. This is the visual environment that needs protection against the rapid growth of local buildings being built against the local regulations of the antiquities authority especially that they are being built in concrete and bricks in ways far from the nature of the traditional mud brick ones quickly disappearing. This is a branching issue that needs to be addressed. Preserving the nature of the landscape as a whole is a major concern.

From another angle, the concept of rendering Luxor as an open museum is one that needs discussion. The concept of this open museum should allow and preserve the original nature and relation between monuments and their surroundings. In its original state temples existed between people and their newer structures, and indeed some of it where built on archaeological features and had to - or needs to be removed - and measures should be taken to prevent any future violations or sprawl. This need to be done in a smooth transparent manner as in some cases the boundaries and protective structures performed a violation themselves to the monument or its environment or both. The city of Luxor in the western bank holds positive and negative examples. (Fig. 5)

Fig.5 (a)

Fig.5 (b)

Fig .5 (a) Although located in a busy urban location, the site of the temple of Luxor is treated in a much better way than the one imposed around the temple of Amenhotep III (b) as it allows for direct unobstructed view for the temple. On the contrary, the case in the western bank is needlessly disturbing the whole landscape especially that it has – like the temple of Luxor – the advantage of having the street level higher than the site's level. The wall is very detached from the nature of the area as a foreign needless implant.

The temple of Luxor from the western side facing the Nile is a positive example with its very low wall deterring people from entering the site but allowing their visual interaction and strengthening the scenic value of the temple on the city's waterfront. From its eastern side facing the inner city by the Abou El Haggag plaza (previously square), the treatment is not equally fluent as steel-work wall disturbs the temple's beauty emphasized by the studied lighting. Indeed the presence of the plaza forms a negative human pressure, but other more horizontal treatments could have been utilized. Not the best solution for an open museum.

In the western bank where open space and natural (anciently manmade) landscape prevails, approaching the needed issue of boundaries needs great wisdom and sensitivity. It also needs a lot of thought and design endeavors.

The vast location teams with very good (actually beautiful) examples of such treatment especially in the necropolis and its tombs mostly buried needing retaining walls. Built with stone chips of the same nature of the site they blend very efficiently into their surroundings. This is a norm not dictated by the main Egyptian Law of Antiquities (The Official Gazette, 2010) or the missing local regulations. The main problem is meat when addressing monuments such as temples in rather flat ground or ones with little levels. This was most apparent in the more recent treatments as in the case of the mortuary temple of Amenhotep III or in the ugly wall of Medint Habo. For some officials, the concept of turning Luxor into an open museum means caging the monuments for regulating visits regardless of the effect of this caging fences or walls on the general landscape.

The Western bank is a world heritage site and should be protected in its pristine state including nature, architecture and all cultural and visual aspects. The loose grip on building activities are changing the area very quickly this was maximized since the 2011 revolution and after. Even the newer architectural work of New Gourna of Hasan Fathy in the 40s and 50s was almost totally trampled by later ugly concrete structures (World Monuments Fund, 2011).

3. Boundaries, visitors and material :

No doubt that archaeological sites needs basically to be defined for many reasons, especially in areas where looting and land grabbing are possible events. They need to be functional but have to come in harmony with the monument, its site and the larger surrounding landscape. Internal visiting arrangements usually form little impact to the landscape and can be understood and praised, but in some cases such arrangements on entrances and exits can form a problem by scaring the nature of the landscape. The proposed design of the exit for the temple of Amenhotep III (A.1- Fig. 2) would scar the landscape deeply with its long stretching higher wall blocking the vista in and out. The same goes even worse for the ugly wall of Medinet Habo (A.1- Fig. 4).

3.1. Boundaries … needs and definition

Form a design and functional point of view the definitions or boundaries need to achieve several goals (Matero 2008) The following extracts their essence :

- Provide site delineation and rendering of the site's boundaries and limits.
- Provide basic security (other technological means can be employed too) and define entrances, approaches and exits. In some cases such security needs to be more than basic especially in areas where pressing threats such as robbery, looting and land grabbing are obvious issues.
- Achieve visual goals of transparency and visual permeability especially if the site had no original walls or fences in its original state. This is even more important in sites located in open landscapes such as in the case of the mortuary temple of Amenhotep III early discussed.
- In cases where the ancient site extends further beneath roads, buildings, structures or facilities, the structure of the boundary should be executed in ways that would not affect any buried objects. Also its removal afterwards should be considered in simple ways.
- It should be noted that the average range of height of most used types of massive walls even if combined with steel work is with the 2.5: 3 meters height. The main function of a wall is not the complete isolation of site but the definition of the site's premises and preventing uncontrolled access. Such walls do not prevent illegal entry but provide more of psychological and legal barrier. Thus achieving this height and definition is possible through other less destructive odd designs.

The ugly wall of Medinet Habo done in haste to protect the temple premises in the chaotic times of the January 2011revolution to protect the temple and its premises from the dense urban mass of Habo is an example of poor destructive treatments despite good intentions. The treatment and effect is visually and aesthetically disastrous to both the complex and the whole landscape of the area as seen in (A-4- Fig. 4). Merely structural walls can seldom achieve good results especially if treaded in such careless functional manner. Height is needed some times for security reasons but can usually be handled in different manner replacing height with other vertical treatments or moats.

3.2. Visitors, security and needs

Preparing archaeological sites for public visiting requires addressing and design of several elements. Important as they are, but the paper does not deal with internal arrangements as long as they do not interfere with the landscape. The term visitor is extended to included visitors of the landscape where the site and its elements (monuments) are part of a holistic scheme. In Medinet Habo, (A.1- Fig. 4) the newly erected ugly wall does not only alienate the complex from its surrounding and negatively affect the visual qualities of the temple as its poor structure is a strong inferior element, but it also pollute the visual qualities of the landscape and deprive the area's vista from the graceful mass of the complex. Other solutions could have been made, but the authority ordered a structure hastily done without concept or consideration instead of a thoughtful considerate project fitting the profound features. Entrances and exits being usually part of the boundaries should occupy a minimum size in ways that do not conflict with the site and its elements or with its landscape. The harsh weather of Egypt and the cultural and visual nature of its sites dictate solutions that may be achieved by locating them as far as can be from the site's elements to allow visual continuity and maintain a reasonable perspective. Different acceptable examples can be found at Valley of the Kings, The Valley of the Queens (A.1- Fig. 5a)and Tombs of the Nobles.

3.3. Materials and design

A lot can be discussed about the material used in different situations around the world (Teutonico; Palumbo, 2000). But a needed discussion would be about the suitability of some materials in the case of the boundaries in open landscapes. Urban situations could have sometimes their special considerations. But in the case of open landscapes with sensitive ecological, cultural or visual nature in country with arid conditions the choice and design of materials is narrowed to a minimum. The western bank although the richest in Egypt with antiquities, but shares many common factors with upper Egyptian archaeological sites.

Archaeological sites have their premises declared and when such premises are large enough having no residential or agricultural areas or other uses nearby and no known buried items the treatment of the boundaries is supposed to be simpler. But in cases where the site and its elements are in close contact with such uses the problem is magnified.

It can be claimed that there would be five main approaches collected from worldwide observations:

1- Using heavier dense sold materials adobes, stones, bricks and even concrete or a combination. Rammed earth also is an option where environmental conditions of soil and humidity allow. .
2- Using lighter more transparent materials such as steel rods, glass, polymers, etc.
3- Using a combination of both above types where the lower part is heavier and the upper is lighter.
4- Using ditches and difference of level in ways that would allow retain the visual continuity while creating separation and obstacle. Needless to say that underground or retaining work will be needed using heavier materials and an above ground element will be needed of either heavy or transparent nature.
5- Delineating the site with the simplest means (posts, wires, etc.) and using technology in different forms for protection.

Heavier dense structures may provide a strong definition but they have their strong blocking effect and strong trauma to the landscape and vista such as in the case of the wall Of Medinet Habo. The outer stone wall built around the Nobels' tombs of the Theban necropolis needs discussion. Red sand stone was used to build the wall neglecting the very positive norm in the area practiced by the authority and expeditions using limestone of the same quality of the site's formation. The same technique is used all over the necropolis for all needed structures blending them smoothly in the landscape. They feel as they were there forever. The wall itself is bluntly imposed without any landscape design considerations. It could have been executed in a lower height from the road side but creating a bigger height from the site's side (necropolis and hills) thus performing a veranda with better visual contact and a lower impact on the landscape.

On the other hand, steel fencing is only transparent when facing, but in perspective the accumulative density of steel members (not to mention concrete column if employed) usually forms a visual dense blocking screen, not to mention its difference of nature and indications from the nature of ancient Egyptian monuments which may form a cultural visual problem such in the case of the provoking wall of the Amenhotep III temple mentioned earlier as the

sheer length and stretch of the wall parallel to the road puts it in a very negative situation in the perspective forming a screen blocking the main vista of the area and its dominating mountain. The solution presented by the expedition due to the pressure practiced by the opposing campaign resulted in a rather positive solution. The case of the temple of Luxor with its positive and less successful approach has been presented earlier.

Modern technology provides means that enables effective management of the boundaries of archaeological sites that can be self-sufficient regarding energy. Such solutions are being installed in visited sites. They provide a visually much lighter impact to the monument and its landscape especially in larger sites where they are visually absorbed if properly treated. The human factor will always be needed but in different manner and as a backup. Considering the landscape values and the maximum view of the site elements as part of the landscape dictates the use of different materials.

4. Results and discussion (Extracting the Primarily Criteria) :

The previous discussion and presentation reveals several issues that must be addressed when formalizing the design criteria for the boundaries of archaeological sites in sensitive landscapes.

- First: The values of the landscape and its components.
- Second: Archaeological sites and their boundaries.

As for the values of the landscape, and in addition to their role as an integral surrounding of the archaeological site, they indicate several issues most of which would be the ecological values and the visual - scenic values with their interrelations. Also, their relation to the cultural and socioeconomic ones in the cases of inhibited or near urban growth as in the case of the western bank. . A critical path is missing between preserving the nature of the landscape and reclaiming the original state of the site to prepare it for visiting under –for instance- the so called open museum concept without neglecting or erasing the accumulative cultural values of the landscape including their visual values from one side and the protection of the site from excessive growing human activities in an overpopulated country from the other side. Regulating this growth in a manner that maintains the cultural-visual nature is a point that needs extensive effort.

The concept of open museum is one that is seen with great controversy so is the view point of authorities and concerned parties. For many officials it means providing the chance for the visitors to see the monuments in the original location in good facilitated conditions without much care to the surrounding upper Egyptian heritage of local population including habits, architecture and rural life style. Such mentality imposed for instance the employment of huge foreign steel work wall in the middle of the western bank detached from everything around it as described earlier. But for others with deeper view, the original location encompasses all the surrounding landscape including the cultural heritage and life style as part of the accumulative Egyptian multi-faceted cultural product of a long stretching Egyptian civilization through time and cultures .The paper adopts the second concept and calls for adopting policies that would insure total preservation for not only the archaeological sites but also the conservation (or preservation) of their larger landscape including cultural heritage.

The architectural treatment of the boundaries of archaeological site would be meaningless unless seen in the larger perspective of its larger site or surrounding landscape. Not only this, but also the manner of treating the archaeological site from within and how it would be presented to the visitors and as an integral component of a sensitive landscape of values. Accordingly, the discussion and results should be directed under two main titles:

THE LARGER SITE AND SURROUNDING LANDSCAPE: According to all that was presented earlier, a major objective would be seeking the preservation of the landscape's spirit and character including its physical shape and its surrounding larger landscape inclusive of its cultural values. The site's ecological order and internal ecological processes should too be preserved and maintained as in it lays the health of the landscape. In cases where human activities and changes have caused change to that, corrective actions should be applied in the course of the landscape management. In the western bank for example and because of the dangerous rise of constant underground water table as a result of the erection of the high dam in the sixties an action was needed to save both archaeological sites and agricultural land, hence , a dewatering pipe system was applied. Sites with well formalized nature and strong character of surrounding landscapes should be declared landscape preserves where conservation policies are applied

to existing activities and existing natural and manmade components. This is much easier when addressing archaeological sites in rather uninhibited areas or where local dwellings and activities are well away from site. Applying gradual zoning as listed in the antiquities law would include the larger landscape and securing its future by setting and applying strong rules and building codes. In the western bank's case a firm building code regaining the spirit of the local architecture should be created and firmly applied to the neighboring buildings of local population as it is becoming lifeless ugly concrete housing.

In landscapes where human local communities with well-defined cultural product and activities are part of the landscape i.e. Architecture, farming with its landscape patterns, etc. preserving the landscape should be dealt with management conservational policies. Theban Necropolice, Luxor – Com Ombo, Aswan – Bani Hasan, Menia are just examples. This means to create first general rules and guidelines and then create local ones for each case.

The existing Law of Antiquities (The Official Gazette, 2010) provides a legal frame work but do not provide a detailed manner for technical approaches or guidelines. Rather, the reference is the general norms of practice and the decisions of the supreme council or concerned Competent Permanent committee subject to personal judgment and vision. Hence, some general guidelines should be created to maintain transparent uniform performance and decisions. The negative events in the cases presented earlier or other examples (A.1- Fig. 7) could have been avoided in the presence of solid guidelines either general or local ones concerning the area.

THE LOCALIZED ARCHAEOLOGICAL SITE AND ITS BOUNDARIES: As mentioned earlier, the existing low of antiquities provides a legal framework but do not provide a detailed manner for approaching technical issues I.e. guidelines. Hence, some general guidelines should be created to maintain transparent uniform performance and decisions. The following can list major results that can be extracted as needed measures to be taken in order to address the paper's aim:

General and on the landscapes:

- National level: Creating General guidelines for the landscapes of the archaeological sites. Such criteria decrease to a minimum the human interference by the authorities and their personal judgment needed for each case. Such criteria may be categorized typologically, geographically or environmentally. The guidelines should indicate management policies too. Formalizing such criteria would need a mixture of archaeological science and rules, visual considerations and ecological design bases (incorporating humans and their cultural and socioeconomically inputs and outputs) and a well formalized inventory of sites forming a synthesized data base. This point would need further effort to formalize. Such guidelines should be referred to in the Egyptian Law of Antiquities.

- Regional level: Neighboring sites sharing common landscape features with defined common environmental and visual characteristics should have a more detailed set of guidelines e.g. temples near agricultural lands in upper Egypt or rock cut structures on hilly geological formations sharing same features. According to such criteria a zoning map for the whole country could be created according to an ecological-archaeological design process. Such a set of guidelines should be inclusive of detailed criteria and management policies and come with accordance to the more generalized higher ones. Preservation and conservation planning and zoning policies should be created at this level and be referred to in the Egyptian Law of Antiquities.

- Local level: For every landscape with archaeological site/s, a book containing a specified detailed set of guidelines, and policies should be created. It should fulfill higher levels of policies but lists in a detailed manner the policies (preservation, conservation and ongoing management) to be applied and followed to maintain the landscape inclusive of archaeological, ecological and visual aspects. Details such as the manner of lighting, railing, curbing should be included and respected and applied by all the state's authorities. For instance, the lighting project of the mountain hill of the western bank was done in a more professional manner in distribution than the older one, but lacked its mystical romantic look of the reddish yellow light that was more fitting than the extensive use of bluish white light. The absence of guidelines created a white light screen fitting a normal building not a mystical necropolis with a sacred

ancient summit. Inhibited landscapes (a common case in Egypt) should be covered also from the view point of cultural, demographic and socioeconomic aspects gaining needed management of the community and its positive and negative effect on the site. Such book lists some specific rules and detailed design criteria and procedures of design process. It should as whole have the strength of law as a complementary component and should be referred to in the Egyptian Law of Antiquities. Such guidelines should be created according to a multi-layered design processes comprising visual, ecological, archaeological, and other human factors such as cultural and socioeconomic ones.

- On the other hand, the same should be applied to the archaeological sites themselves. Accordingly, the same guidelines appointed to the surrounding landscape of archaeological sites on different levels (General or national – zones or regional – local) should provide subsequently in the same manner detailed guidelines for the archaeological elements or complexes and their premises and boundaries. It should be able to create all needed functions of preservation, conservation, and smooth relation with their surroundings. Maintaining the spirit of the place is a very important issue and is usually neglected. The case presented earlier of the temple of Amenhotep III is very reveling. Through such guidelines and detailed regulations, the design criteria are created channeling the personal endeavor of designers on technical solutions and providing solutions within the parameters provided. Some literature should cover the preservation of the place's spirit and identity kept raw as much as possible. The innovation of designers should be directed to that area too through the design criteria formalized by the guidelines adopted and imposed.

The following points address the boundaries themselves. The resemble some main consideration but not all:

- In cases where the ancient site extends further beneath roads, buildings, structures or facilities, it is well known that the structure of the boundary should be executed in ways that would not affect any buried objects. Also its removal afterwards should be considered to be done in the simplest manners. In the western bank one can easily notice the difference in treatment in neighboring sites (A.1- Fig. 6). It can be noticed that the simple wiring and earth trenching provided maximum visual accessibility while the higher than sight's level mud brick wall blocked the vista totally for both site and landscape. While the mud brick wall is an acceptable material but its height is not. Creating adobes from desert clay with more matching color to the environment would have been better regarding the direct surrounding. In other areas the dark adobes can be more suitable. Boundaries even temporal should not by any means block the view of the site or its landscape. In the western bank this is essential regarding the whole surrounding, contrasting landscape (green and dry), vista and spirit of the place.

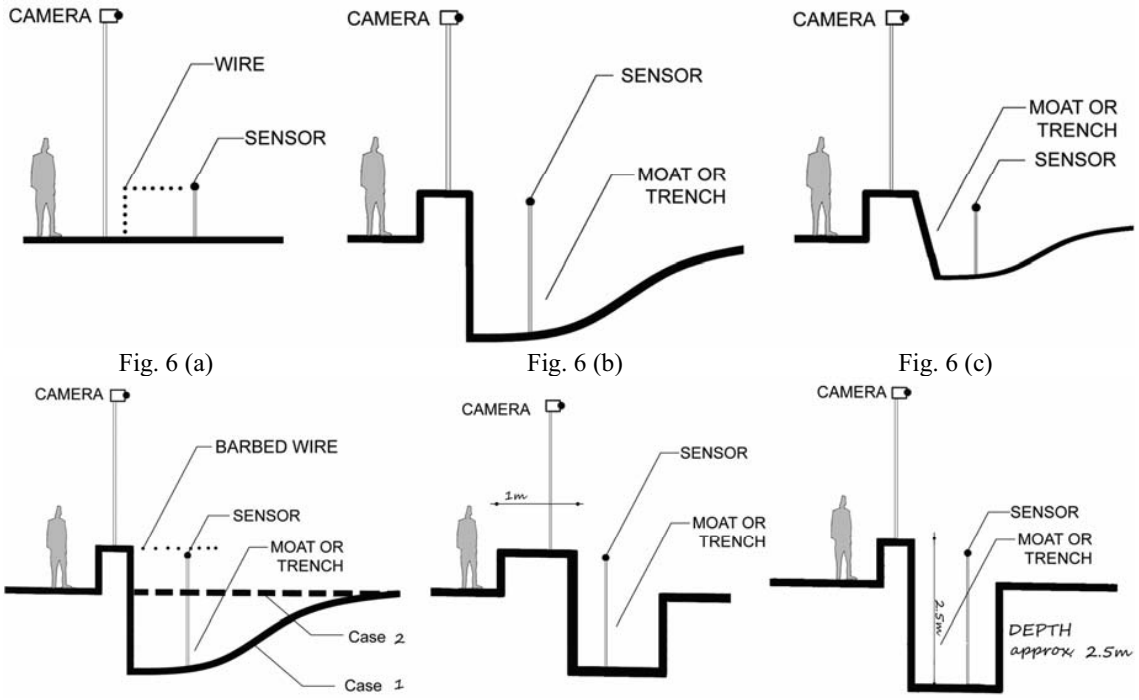

Fig. 6 (a) Fig. 6 (b) Fig. 6 (c)

Fig. 6 (d) Fig. 6 (e) Fig. 6 (f)

Fig.6 Several solutions can be employed to create the function of boundaries without the need of raising their level in ways that can disturb the visual aspect of the archaeological sites and their surroundings landscapes. In concept they provide horizontal solutions above ground level and may be aided by vertical ones below site vision level. This may make use of a maybe existing difference of levels or it can be created either through landscaping and architectural approaches. Replacing vertical solutions with horizontal extended stretched wires or barbed wires below vision level, thus achieving transparency and visual freedom is an option. All such solutions may and should make use of modern technology of camera and sensors, etc.. Figure (a) for instance provides a totally transparent horizontal solution where landscape level is equal on both sides. Employing moats of different types and depths is also a possibility that can serve other functions. Figure (e) provides a solution where horizontal extended level is a main barrier.

- A

provoking question is always about the nature and design of boundaries. The past discussion shed some light on material and design that needs to be concluded in two main concepts, the first addresses visual aspects while the second addresses technical ones. Ecological considerations form a frame work for both considering that part of a landscape's integrity is its visual characteristics emerging from its ecological order. Human factors (cultural, socioeconomic and so) too from another framework. In a balanced situation they would be within the landscape's (the ecosystem) capacity to sustain both ecologically and visually. But in the more common cases, human factors seem to form a vicious burden on the landscape. This is a common case in over-populated communities especially in situations where the sustainable pre-industrial life style is gradually abandoned like in the case of most developing countries. Luxor's west bank is no exceptions as serious changes took place in the last few decades forming a strong pressure on the natural and built environments. On the other hand, human community forms an irreplaceable component of the cultural environment and spirit of the place. Hence, a delicate balance is needed generally when approaching preservation of the sites and conservation of the landscape. Handling boundaries from this point of view is presented in the following.

- Massive walls should be avoided above ground level to the minimum and be banned above the 1 meter height to allow for visual continuity using matching natural material .They can be used with suitable heights as delineation allowing seating and rest for visitors. The application in the necropolis is very good using local material while the example of the new necropolis wall is less successful being higher than should be and employing foreign reddish sand stone thus affecting the vista and its continuity. (A.1.Fig.5.).

- Modern technology offers many solutions that would minimise the need for heavy or hardscape solutions replacing it with soft ones. The use of cameras and sensors and so can decrease to a minimum the need for structures in the classical manner. Application is common place already in many areas. In upper Egypt with its sunny weather, solar sources of energy is available almost continuously. A point needing further study.

- It can be concluded that it is best to eliminate to the minimum solutions with visual impact to the site and its landscape. In Western Thebes the whole landscape is sensitive so the maximum care should be taken. It is not only to preserve archaeological heritage but also to preserve its surrounding and the life style still carrying traces of ancient spirit and traces of cultural accumulation. Thus, the thin line between protection and site's integrity (including its larger landscape) needs to be struck. This would be achieved through well formalized design criteria based on obligating guidelines.

- Vertical solutions: Any vertical solution higher than 1: 1.1 meter (can be more or less according to the situation and its relation with the angle of vision) is not recommended. So is the fallacy of transparent steel members forming a wall as they form a foreign body to upper Egyptian environment and its ancient Egyptian sites and should be limited to the minimum. Steel forms an excellent solution for gates and rails, movement control and members carrying technical soft solutions (cameras, sensors and so). Massive vertical elements must be avoided. In cases where a difference of level between the site and its surrounding (as in the case of the temple of Amenhotep III), maximizing this level by the employment of small massive structure (Mud bricks, Rammed earth, stone or so) in harmony with surrounding nature and with a maximum height of 1 meter (would add to the difference of levels). Further enhancement of height can be achieved by creating a ditch or moat under the wall. Also, horizontal elements of wiring can be used below vision level in a hidden location in cases where extensive protection is needed. In the case of the mortuary temple of Amenhotep III the new walls of are painfully imposed. The newly introduced one under the public campaign's pressure seems quite suitable and sufficient especially if aided with electronic software solutions.

- Horizontal solutions: Second to low transparent solutions of simple wiring, they provide the least visual and also ecological impact as they allow natural flow. They can be shaped in the form of naturally looking mounds and ditches but needing some delineation with horizontal wiring and technical installations, perfect for sites with ample area. In cases where more solid definition is needed, low-height continuous or intermittent wall might be employed utilizing local materials blending with the prevailing environment. As mentioned earlier and in a combination with vertical retaining walls, massive walls with some width combined with moats can provide very satisfactory solutions with variations. Moats can be used also as runoff water control and in the management of rising ground water level. Another form of horizontal solutions is the use of multiple parallel horizontal wires lower than sights level either used alone or hidden beyond small massive wall or vertical set of wiring forming an inverted L (Fig. 6.a.)

5. Conclusion :

Solid formalized guidelines and code of rules should be set for the design and architectural treatment of the complementary elements of archaeological sites especially in landscapes with sensitive ecological, scenic or cultural sensitivity or uniqueness especially that Egypt has a richness in such sites and are threatened by human factors that may cause not only damages but eternal change in surrounding landscapes forming part of the sites' history, identity and nature. Their boundaries being the interface with their surrounding landscapes have a primarily importance as they form many functions such as definition, delineation, security and even protection from natural threats such as flash floods, if any. Such guide lines should aim for creating minimum visual and environmental impact either on the site, its elements or its larger surrounding landscape. National general rules and guidelines should be laid down decreasing the need and dependence on the human factor and judgment of concerned committees. Also, more specified regional ones should be laid down to each region with archaeological sites sharing common features of their surrounding landscapes, then specific detailed ones should be laid down to each area or landscape with common features. Some individual sites may need even their own details. In Luxor's western bank for instance two major types can be identified, one concerns sites in the hilly dry environment with its limestone structure and rubble. The other concerning sites in the flatter open sites of the agricultural valley or near it in flat sites. Boundaries in such cases are more problematic and should be treated through several techniques. It is urgently needed to correct past negative practices especially those done in the last recent years. Modern technology can be a great aid in that respect as it can decrease the dependence on traditional security measures and techniques needing higher walls and intensity of personnel. These in turn will dictate some major changes in the management matrix and structure but with better performance as discussed earlier. In short a trend towards the more soft and environmental with better performance and less impact would gradually replace the more opposite applied currently. The presence of detailed guidelines both general and local would be the governing factor in a sound application and sustainable management, conservation and preservation. For the Western bank of Luxor a deep discussion of the definition of the open museum concept is greatly needed as such a concept of a museum in open landscape with living inhabitants forming an important integral part of its identity needs to be redefined before creating any guidelines for it. Some recent negative protection measures needs immediate correction. The paper calls for reclaiming Luxor's Western Bank atmosphere to an older point in time where both archaeological sites and local cultural landscape of architecture performed a true life museum of Egyptian culture laden with experience and spiritual, cultural and visual values. A unique hybrid eco-cultural model can be created based on - and reviving - the past and near past atmosphere employing soft technology to eliminate industrial aggressive solutions. The microchip of the post industrial can be finally installed in the mud brick of the pre- industrial rectifying the accumulative errors of industrial mode of thinking.

6. Acknowledgment :

The author would like to thank all members of the SAVE THE WESTERN BANK campaign especially local Egyptians of the area who were keen to preserve their environment and its heritage including landscape and culture and who had a built-in sense and understanding of the nature of the monuments and their relation to the larger perspective of the area than most of the officials handling the issue as they know that its preservation is the key of sustainable management. Special thanks should go to the Egyptian intelligentsia knowing the value of their heritage and active journalists who raised the issue in the media. The efforts and worries of all those groups triggered the idea of this paper.

Appendix A. Figure Appendix

A.1. Figure 1

Fig. A.1.1. (a)

Fig. A.1.1. (b)

Fig. A.1.1. (c)

Fig. A.1.1. (d)

Fig. A.1.1 (a & b) The serene homogeneous landscape of the western bank of luxor comprising the elements of nature (The Hilly Mountain, the vegetation) , the fields, the ancient structures of archaeological sites and the vernacular local architecture (b) showing an older view of the site. A sudden attacked by a shocking inferior structure of a surrounding wall in terms of design , material , and most important in its very negative destructive effect on the visual, scenic and cultural values of the landscape and the archaeological site of Amenhotep III mortuary temple. The area has one of the best vistas in Luxor with its natural Egyptian vegetation blending with other accumulative manmade structures and landscape (c & d) The sheer size and length of exposure to the area's fragile vista and its location on the entrance perspective with a length exceeding 1100 m renders its sensitivity and the negative approach. The authoritarian design was imposed without any local or group dissections either with the local or cultured Egyptian community. Accordingly, they formed a campaign to save the western bank as a whole.

A.1. Figure 2

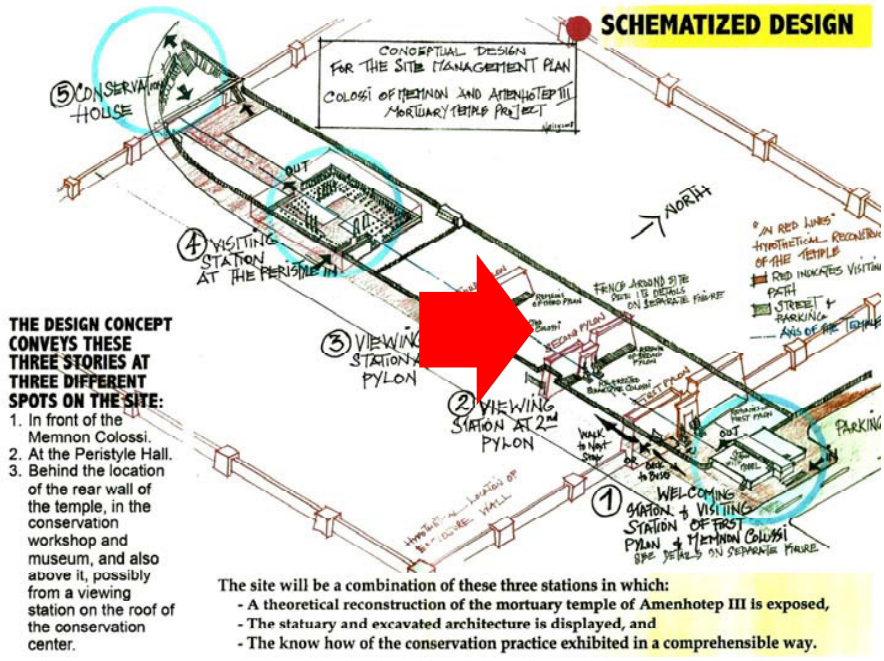

Fig. A.1.2. (a)

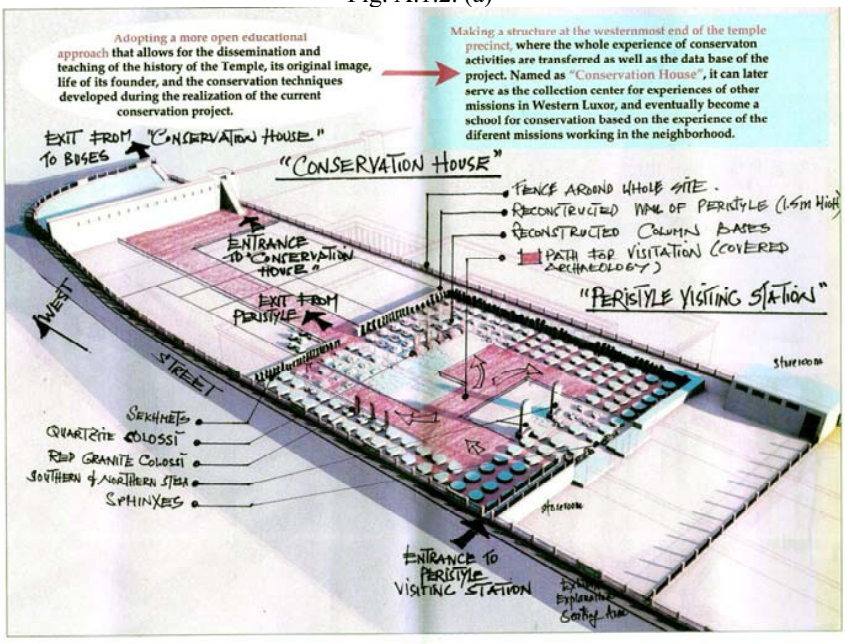

Fig. A.1.2. (b)

Fig. A.1.2 The imposed design presented by the expedition(Sourouzian & Stadlemann 2013) and approved by the Egyptian ministry of antiquities (in the absence of governing guidelines deliberately neglected the area's long established norms and public opinion and simplest assessment of visual aspect. The scheme included a surrounding wall with strong negative effect on the area's spirit despite the fallacy and claims of transparency .The repetitive stretched structure forms a sore to the internal and external historic landscape. The lower level of the site than road level allows for a totally different solutions needing no raised walls. Another destructive violation is the raised exit wall with a solid raised massive wall blocking and affecting the whole area replacing a model natural upper Egyptian edge landscape (A.1.Fig. 1 a). The Visual aspect shown generally in (A.1.Fig. a) and detailed in (A.1. Fig. b) shows this horrendous measure that should not be allowed and raises exclamations about a careful study from both designer and authority to the visual aspects. Again, a case of missing guidelines.

A.1. Figure 3

Fig. A.1.3. (a)

Fig. A.1.3. (b)

Fig. A.1.3. (c)

Fig. A.1.3 Due to the absence of restricting transparent guidelines and the total dependence on the personal judgment of the members of Competent Permanent committee major irreversible decisions can be taken disfiguring the archaeological sites and their historic landscape. The colossi of the northern gate of the temple of Amenhotep III were found broken and buried in the agricultural land Figure (a) shows the now lost original outline of the temple. With claims of fear of soil, water level; and salts, they were relocated in higher ground squeezed between two other mortuary temples (Tawesret and Merneptah), (a, b) thus, disfiguring the original temple and changing the authenticity of the landscape and its values of distribution of its elements and related scenic values. (c) The structurally reconstructed colossi are now in a foreign location and it would be very hard to relocate them in their position due to their structural condition. They should be in the in the lower vista of the temple complex not the higher of other temples .Other simple solutions could have been taken to re-erect them in their own place as the rest of the temple with an advantage of modern studied basement and insulation. The old barred wire is not a bad solution if used horizontally as will be indicated later.

A.1. Figure 4

Fig. A.1.4 (a)

Fig. A.1.4(b)

Fig. A.1.4 (a & b) (a) The temple of Habo was surrounded with a solid wall lacking any design or considerations (approved and built of course by the authorities) . The wall surrounded the large complex totally scaring the landscape and enclosure (a) or closing the temple mass from the view in other areas (b) . The very picturesque landscape and vista of Habo is lost deliberately despite the objection of the helpless local community. The objection was not about the presence of a boundary, but the ugly blocking manner.

A.1. Figure 5

Fig. A.1.5 (a)

Fig. A.1.5(b)

Fig. A.1.5(c)

Fig. A.1.5 (a & b& c) (a) The Norm of practice in the necropolis depends on using natural local stones for retaining , protection and delineation is very successful . (b) Matching plastering is sometimes used with lesser visual efficiency (valley of the Queens) although the majority is stone in stone. (c) Surrounding the necropolis with a higher than needed wall using red sandstone was not a good solution for both its height and material. Being in natural stone decreased its negatives effect..

A.1. Figure 6

Fig. A.1.6 (a)

Fig. A.1.6 (b)

Fig. A.1.6 (c)

Fig. A.1.6 (d)

Fig. A.1.6 (a & b & C & D) Types of boundaries in the area . Having their negative aspects but they are mor homogenious than the new imposed one. (a) Barbed wire around the Ramessium are very transparent and preserve transparency .(b) Higher adobe wall of the temple of Merenpetah is unnecessarily higher obstructing view although suitable in nature especially if yellow desert clay was added to the mixture. (c) The added red sand stone wall ot the nobles, with varying heights, usually more than needed. (d) Showing how a more transparent solution was needed. The use of local limestone with lower height aided with small open oat could have been a much better solution.

A.1. Figure 7

Fig. A.1.7 (a)

Fig. A.1.7 (b)

Fig. A.1.7 (c)

Fig. A.1.7 (a) The concept of creating definitions and boundaries imposed by the authorities to protect the archaeological area or surround the growth of neighbouring urban masses is good in concept . In application they create ugly massive walls closing the vista and area view with foreign structures, thus scaring the landscape and its cultural and touristic value. Same functions can be achieved with simpler more transparent approaches.(b) The ugly wall prohibits urban sprawl but do prevent the visual clutter of the buildings beyond. Boundaries here can have a different meaning treating the landscape and architecture of both walls and buildings in an ecological reflecting deep local landscape spirit.(c) Even boundaries built with a degree of care represent a repetitive form not relating to the spirit of the area. They too form alien bodies to the landscape and its spirit. The 2.5 : 3 m usually needed height can be achieved in many ways as indicated in the results .

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